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OF

THE NEW YORK ACADEMY OF MEDICINE

INCORPORATED 1891

SEPTEMBER, 1933

PUBLISHED MONTHLY BY

THE NEW YORK ACADEMY OF MEDICINE

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New York, N. Y.

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BULLETIN OF
THE NEW YORK
ACADEMY OF MEDICINE

VOL. IX SEPTEMBER, 1933 No. 9

DIABETES MELLITUS—PROBLEMS OF PRESENT DAY TREATMENT*

HERMAN O. MOSENTHAL

We meet this evening to honor the name of Hermann M. Biggs, whose tireless and successful efforts in behalf of this community were carried out as an officer of the Department of Health of New York City.

It is most appropriate that this same organization, at the suggestion of its Director of Health Education, Dr. Charles F. Bolduan, has initiated the present study of the prevention and treatment of diabetes mellitus in New York City. For the past year, a sub-committee of the Committee on Public Health Relations at the New York Academy of Medicine has been actively engaged in investigating this subject and it is to the discussions of this group, of which I had the honor of being a member, that I am indebted for many of the ideas expressed here.

Doctors Emerson and Bolduan have furnished the charts concerning the mortality statistics of New York City, and Doctor Dublin the data in regard to the causes of diabetes deaths and many other facts.

* *Hermann Michael Biggs Memorial Lecture, delivered at The New York Academy of Medicine, April 6, 1933.*

The main points to which Health Commissioner Wynne and Dr. Bolduan called the attention of The New York Academy of Medicine, are that at the present time about two thousand diabetes deaths are registered annually in New York City, that the diabetes death rate is about fifty per cent higher than it was only twenty years ago, and that these facts call for some remedial effort.

Statistics

Chart 1 shows that for persons of both sexes the diabetes death rate in New York City has risen from 2.1 per hundred thousand of population in 1866 to 29.2 in 1932. The total number of deaths has risen from 15 in 1866 to 2,116 in 1932. A distinct rise in the number of diabetes deaths is occurring not only in New York City but throughout the United States as shown by the mortality statistics from other cities.

Chart 1

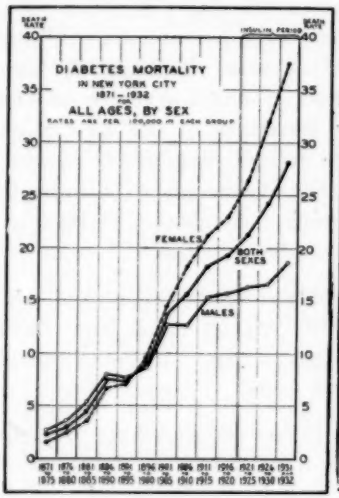
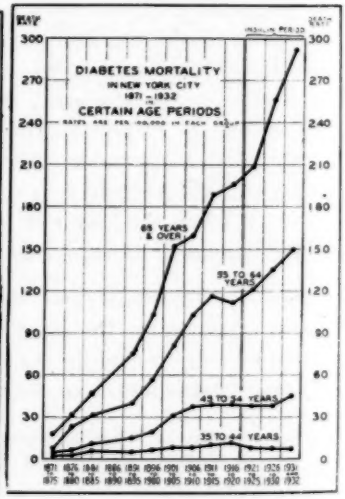


Chart 2



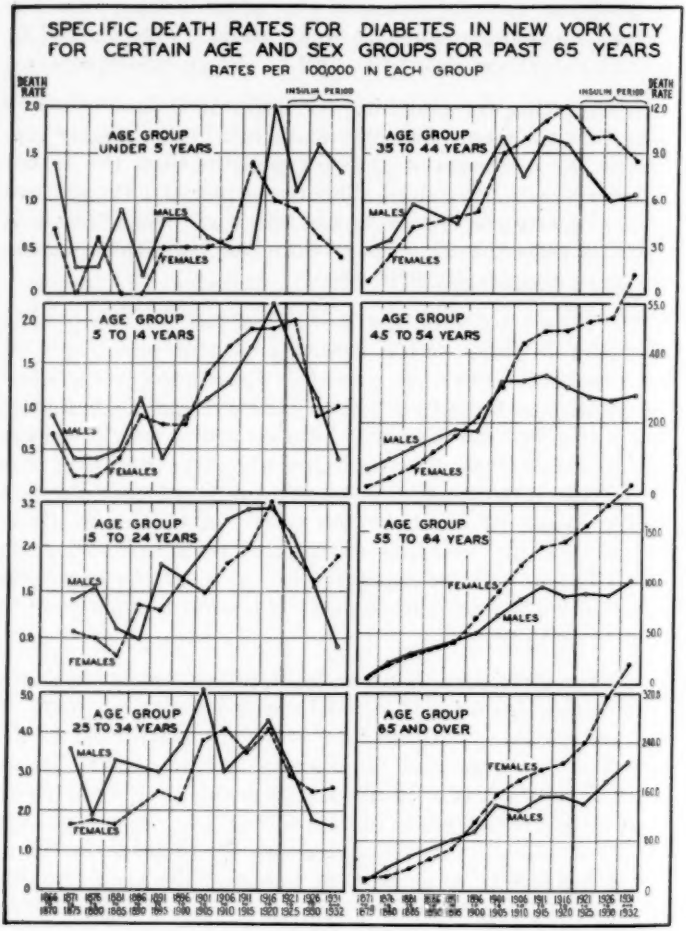
Up to 1905 the death rate for males and for females was almost the same, but thereafter the rates for the two sexes diverge—that for the females rising more sharply so that by 1932 the rate for females was about double that for males. The same change in trend about 1900 is noted in the individual age groups as will be shown subsequently.

In analyzing the mortality statistics it should be made clear that the term "diabetes death rate" more nearly represents the incidence of diabetes mellitus than the actual diabetes death rate, since diabetes is usually, though not always, given preference as the cause of death which is officially recorded when more than one condition is mentioned on the death certificate.

The rising scale of the mortality rate in the graphs of Chart 3 gives ample evidence of the prevalence of diabetes in the older age periods. There are certain additional facts to be deduced from Charts 2 and 3. A change in the trend of the mortality rate occurs in nearly all age groups about 1900. The most probable explanation of this fact is the introduction of the international classification of the causes of death by the Board of Health in 1901; this system of recording deaths has been followed from that time on and consequently the statistics in regard to New York City are only strictly comparable from year to year since 1901.

After 1920 there is a marked improvement in the death rate in females under 45 and in males under 65 years of age (Chart 3). This may be definitely attributed to the effective use of insulin. In women over 45 (Chart 3) the rise in the death rate continues its previous upward trend in spite of insulin, while in men this is true only in the age group of 65 and over. This increase in diabetes deaths of older females is so great that it outweighs the favorable influence of insulin in the other age and sex groups and results in a distinct rise of the diabetes mortality as a whole. It is true that physical examinations are more frequent and more thorough than they were a few years ago. This produces an apparent rise of the diabetes mortality rate.

Chart 3


SPECIFIC DEATH RATES FOR DIABETES IN NEW YORK CITY
FOR CERTAIN AGE AND SEX GROUPS FOR PAST 65 YEARS
RATES PER 100,000 IN EACH GROUP
DEATH RATE
INSULIN PERIOD
AGE GROUP UNDER 5 YEARS
AGE GROUP 35 TO 44 YEARS
AGE GROUP 5 TO 14 YEARS
AGE GROUP 45 TO 54 YEARS
AGE GROUP 15 TO 24 YEARS
AGE GROUP 55 TO 64 YEARS
AGE GROUP 25 TO 34 YEARS
AGE GROUP 65 AND OVER
MALES
FEMALES

The data concerning this disease, obtained from twenty-four hospitals in New York City for the year 1931 by Dr. Alice Paulsen, show that much remains to be accomplished in this direction; of 1,617 cases of diabetes treated in these institutions, 318 or 19 per cent of the total, were diagnosed only after admission to the wards for the treatment of some other ailment. The increased number of applications for life insurance by women and their more frequent participation in business activities, both entailing medical examinations, undoubtedly are factors which add to the recorded prevalence of diabetes in this sex during recent years.

There has been a distinct aging of the population in New York City. In 1900 the age group 45 to 64 was 13.1 per cent of the entire population, while in 1930 this group constituted 17.3 per cent of the entire population. In other words, the proportion of this group increased over 32 per cent. Similarly, the age group 65 and over, increased from 2.8 per cent in 1900 to 3.8 per cent in 1930. This is an increase of more than 35 per cent in the proportion of this age group. These facts have a distinct bearing on the interpretation of the mortality statistics. Drolet (J. A. M. A., March 11, 1933, Vol. 100, pp. 733), computes that in the light of these figures the diabetic death rate for New York City in the thirty years from 1900 to 1930, rose only 58 per cent whereas according to the crude death rate not adjusted to the aging of the population or the growth of New York City, it increased nearly 100 per cent. While these statistical facts lessen the significance which should be attached to the rise in the incidence of diabetes, they do not do away with diabetes as a health problem.

The use of insulin has effected great changes in the clinical course of diabetes. According to the statistics of Louis I. Dublin (data of Dr. Elliott P. Joslin analyzed by the Metropolitan Life Insurance Company) there is a drop from 1900 to 1930 of about 50 per cent in the diabetes deaths due to coma and a rise of about 35 per cent in those attributed to cardiovascular conditions, renal disease and gangrene.

Changes in the Causes of Death of Diabetics. Figures as Percentage of All Diabetes Deaths Experience of Elliott P. Joslin

	1898-1914	1926-1930
Coma	60.8	11.4
Cardiovascular, renal and gangrene	15.5	49.6
All other causes	23.7	39.0

It is certain that Joslin's results are probably more favorable than those of any other clinic, but even they do not achieve the ideal of perfect control, that is, the entire elimination of diabetic coma. The carelessness of patients and the disregard of diabetes during surgical and other emergencies are mainly responsible for the persistence of a considerable number of coma deaths. The increasing frequence of arteriosclerosis and its complications in the diabetics who live to grow old, thanks to insulin, is well shown in these figures. In our experience the diabetic who has maintained a sugar-free urine almost constantly, will not develop these much-dreaded complications. However, the determination of exactly what factors are concerned in the causation of arterial changes and their sequelae, is one of the most urgent problems in our effort to check diabetes. Only when this subject is completely elucidated will it be possible to state with assurance, what can now be only tentatively claimed, namely, that the complete and constant control of diabetes virtually amounts to a cure, even if the disease itself cannot be eradicated.

Treatment

The principles of the treatment of diabetes are established on as sound a basis as is possible with the present-day knowledge of normal and pathological carbohydrate metabolism in human beings. The accepted criteria for successful treatment are:—the constant maintenance of normal nutrition, blood sugar and plasma cholesterol, and a urine free from sugar in the clinical sense. These are very high standards for it is debatable whether or not the

unwavering adherence to natural levels of blood glucose and cholesterol is very significant. The remedial measures, however, used to achieve these ideal objectives of therapy, leave much to be desired.

Within the short period of one generation, clinicians have participated in controversies concerning the exclusive administration to diabetics of diets that were, physiologically speaking, distinctly bizarre. I refer to the starvation and high fat systems of feeding and to the more recent advocacy of excessively large amounts of starch. While extreme diets of this sort meet certain emergencies, they cannot be used continuously without grave consequence. The routine food intake of the diabetic must be considered suitable in the measure in which it meets the vital needs and the personal tastes of the patient.

Radical changes in the diet may be required for many reasons, such as: excessive loss or gain in weight, variations in the carbohydrate tolerance, shifting in the level of the blood sugar and cholesterol, an aversion to, or a strong desire for certain foods, the demands incident to surgical intervention or infectious diseases. Essential alterations in the diet should be made only after thoughtful study; carried out by the patient without the aid of medical advice they entail an unwarranted responsibility. For this, as well as for other reasons to be mentioned subsequently, more frequent medical counsel and less self-treatment than is advocated in many quarters, seem desirable in the routine care of diabetic patients.

Many physicians, nurses and patients are openly scornful of the use of qualitative as opposed to quantitative, i.e., weighed diets. Patients with this point of view can be accommodated without distressing or inconveniencing any one except themselves, but the physicians and nurses who insist on accurately weighed and meticulously calculated diets for all cases, may spread discontent and tend to impose an unnecessary burden on many already afflicted with a permanent handicap. Weighed diets are undoubtedly

necessary for the satisfactory control of many cases of diabetes, but eating by grams should be avoided whenever possible since the attendant ceremony and formality tend to provoke an undue nervous tension. A rational dietary, without sugar or sweets, in which the amounts of food with a high carbohydrate content are approximated by household measures, may often be advisedly carried out even when the patient is using insulin. But again, the responsibility should rest entirely with the physician who should be the arbiter of what is most advantageous in each case.

Finally, as regards the self-regulation of the diabetic patient. This disease when it has once appeared is a life-long problem and its treatment if it is allowed to become a full-time occupation to the patient, tends to prove irksome and to result in nervous strain that affects the carbohydrate tolerance unfavorably. The daily urine analysis of a twenty-four hour specimen by the patient is not advisable. In the first place, the analyses of several single specimens usually yield more valuable information for the regulation of treatment, since this method of examination will determine in which meal the carbohydrates are in excess, or which dose of insulin is insufficient; in the second place, the collection of a complete twenty-four hour specimen is usually accomplished only with some discomfort and sacrifice; in the third place, the analysis of the patient's urine by himself or one of his family, is likely to be associated with considerable introspective doubt.

Taking all these facts into consideration, it is suggested that the amount of responsibility for self-examination and treatment to be asked of each patient, should be reviewed with great care. Many patients are unable to be objective about their condition and are rendered unhappy by self-investigation and regulation. The patient's welfare is the responsibility of the physician and he should discharge this trust in full without unnecessarily shifting any obligations on to the patient, whose carbohydrate tolerance is so often sensitive to nerve strain.

The family physician should be the hub of the wheel about which routine management of the diabetic patient centers. Post-graduate medical instruction in the simple, direct, effective treatment of diabetes should be constantly available in every large city and thus make it possible for every practitioner to review the principles and methods of therapy at all times. Every hospital should have its resources so organized that the medical, the surgical and the nursing staffs, the laboratories and the diet kitchen are capable of meeting all diabetic problems and emergencies. The occurrence of coma, of a severe infectious disease, or other complication in a diabetic patient, may call for almost hourly observation and therapeutic adjustment, and is therefore much more satisfactorily controlled in a properly equipped institution than by a single physician in the patient's home. While the routine treatment of the diabetic should be carried out by the family physician, additional medical advice should be sought by him when the ideal objectives of treatment are not maintained, since a deviation from them for a few years or even a few months will result in irreparable damage.

Etiology

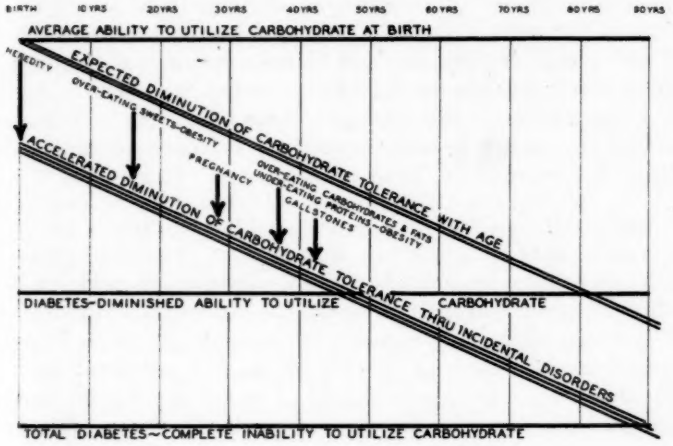
The causes of diabetes must be thoroughly understood if reasonable and effective measures are to be carried out for its prevention and cure. The diagnostic criteria and the causes of diabetes have not been satisfactorily established and consequently steps intended to control this disease cannot be advocated with complete confidence. The enforcement of guides to health, whose validity is not fully established, may result in harm as well as good. The suggestion is made that all the factors concerned in the causation of diabetes should be subjected to thorough scrutiny and further study before preventive measures based upon them are urged for general adoption. A brief review of the situation from the angle bearing on the preventive and active treatment of diabetes is important.

Definition and diagnosis. Diabetes mellitus may be defined as a disturbance consequent upon a diminished ability of the body to utilize glucose. This is a very brief and simple definition which is certainly correct as far as it goes but it is open to criticism since it does not include the cause of the disease. The diminished carbohydrate tolerance is usually attributed to changes in the pancreas. Postmortem examinations often reveal such lesions but there are so many instances in which the pathologist fails to demonstrate any abnormality that some skepticism concerning the validity of the unitarian doctrine of the pancreatic etiology of diabetes is justified. The unnatural activities of many glands besides the pancreas, such as the adrenal, the thyroid, the liver, the pituitary and numerous others, some partially explored, others scarcely thought of, play a role in the assimilation and the oxidation of glucose. The fact that insulin remedies the situation does not warrant our regarding this as a purely substitutional therapy for pancreatic deficiency because its effects may be in part compensatory for an altered activity of other glands. When we speak of diabetes, therefore, we are discussing a diminished tolerance for glucose which, according to some is invariably due to pancreatic disease, and according to others, to extra-pancreatic disturbances as well.

The fact that diabetes is thought of primarily as a disease characterized by an impairment of carbohydrate tolerance, is demonstrated by the nature of the only diagnostic measure for diabetes in common use today, known as the sugar, or glucose, or carbohydrate, tolerance test. This test concerns itself solely with the ability of the body to utilize carbohydrates. Every case of diabetes exhibits a diminished glucose tolerance, but every instance of diminished glucose tolerance is not a case of diabetes. This shows that while our definition of diabetes is the best possible at the present time, it is not an exact description of the disease "diabetes" since there are no pathognomonic signs by which it can be identified. Improvement of the present-day treatment must be based on a clarification of these questions. The possibility that not one but several

Chart 4

THE INHERENT TENDENCY TO DIABETES IN HUMAN BEINGS AND FACTORS THAT ACCENTUATE IT



different forms of abnormal sugar digestion are included under the name "diabetes", is shown by the great and unexpected variations in its onset and in its clinical course.

Though diabetes cannot be accurately described, a consideration of the influences which favor its incidence is in order. The definition of diabetes is graphically presented in Chart 4.

There are three horizontal lines indicating: first, normal carbohydrate tolerance; second, a degree of diminished carbohydrate tolerance at which point diabetes is thought to begin; and third, the lowest line designed to represent the complete loss of carbohydrate tolerance, which when it exists in human beings, is called total diabetes. On these lines have been plotted the various influences that may in the course of a lifetime be expected to affect the carbohydrate tolerance.

Degenerative processes, arteriosclerosis. With advancing years degenerative processes manifest themselves necessarily in the glands, because of the natural wear and tear of the tissues, or as the result of arteriosclerosis. This accounts for the diminution of carbohydrate tolerance, that is, the mild diabetes of the aged. The falling line in Chart 4, crossing the level of curtailment of carbohydrate tolerance indicative of diabetes at about 80 years of age, is a suggestion of the average course of events in human existence. Some persons will give evidence of diabetes from this cause at 60, 50 or even 40 years of age.

Although this line is a purely arbitrary one, it is undeniable that a constant diminution of carbohydrate tolerance and a tendency to diabetes develops in practically all persons as the result of inevitable degenerative changes. We are accustomed to regard with equanimity rising blood pressure, thinning and greying of the hair, diminution of physical vigor and other marks of deterioration in older individuals, because they are considered the inevitable physiological processes of the passing years. There is every reason to believe that the organs which control the metabolism of glucose are affected in the same way. Thus the problem of the prevention of diabetes from this cause resolves itself into checking the diseases of old age, which is a general question for solution and is not to be specifically engaged in by those who are interested in perfecting means for the control of diabetes.

Heredity. Heredity is believed to be a factor in about twenty per cent of cases of diabetes. According to some careful investigations, heredity in diabetes appears to follow the Mendelian law. Insulin has enabled youthful diabetic patients to attain maturity and to become fathers and mothers, and has made it possible for the diabetic woman to carry through pregnancies successfully. Because diabetics, since the introduction of insulin, can have children in the same proportion as normal persons, it is evident that the hereditary factor will result in a rising incidence of diabetes. The bearing of an inherited diabetic

tendency on the carbohydrate tolerance is indicated in Chart 4. The degree and the rapidity of involvement of the carbohydrate tolerance indicated by the lines in Chart 4, will vary a great deal from case to case, and it must be understood that in its present form this graph expresses only tendencies, and not hard and fast curves of mathematical precision. The solution of controlling heredity as a cause for diabetes is according to all present day humanistic principles, not a direct one but a policy of patience that waits on the discovery of a cure for diabetes.

Pregnancy. Pregnancy has a marked influence upon carbohydrate tolerance and diabetes. Renal glycosuria, a permeability of the kidney to glucose below the normal level of blood sugar, is often found in pregnant women. This is a harmless anomaly, not a disturbance of the carbohydrate tolerance, and is not related to diabetes in any way. The consensus of experience is that during pregnancy, diabetes may develop, that latent diabetes will be accentuated and that an existing diabetes will be aggravated. After pregnancy, carbohydrate tolerance may return to its ante partum efficiency or it may be permanently impaired. Pregnancy may therefore be considered as an immediate cause for diabetes in some instances.

Pregnancy may damage the carbohydrate tolerance but not to a sufficient degree to cause the immediate appearance of diabetes. The progressive diminution of carbohydrate tolerance expected with age would consequently reach the diabetic level at an earlier period of life in the woman who has borne children than in the one who has not. This idea is expressed in Chart 4. This theory, which would be a large factor in accounting for the high incidence of diabetes in females over 45, could be either proved or disproved if comparative data were available of women who have borne children and of those who have not.

The relation of pregnancy to the diabetes problem, therefore, consists in the avoidance of strain or impairment of the carbohydrate tolerance during puerperium and child-

birth. How this is to be accomplished is not known and it is a matter of further investigation to determine what can be done.

Gall stones. Gall stones are often regarded as a cause for diabetes. A stoppage of the common duct by a calculus results in the forcing of bile into the pancreatic tissue and a consequent injury to the Islands of Langerhans. In addition, cholecystitis will affect the carbohydrate tolerance adversely as is the case with any infection, and it will accelerate degenerative processes and arteriosclerosis, thus favoring the development of diabetes. The interrelation between gall stones, diabetes, cholesterol metabolism, obesity and pregnancy is so complicated that it is impossible to explain it satisfactorily and most phases of this problem are awaiting an intelligent solution. Since gall stones are more common in women of forty years or over, than in men, another factor besides pregnancy is indicated to explain the increasing incidence of diabetes in females over 45 years of age.

The management of gall stones and their complications with a view to effective prevention of damage to the carbohydrate tolerance, has thus far received scant attention and it would be futile to speculate on this matter because there is a lack of precise knowledge of this subject.

Diet - obesity. Faulty habits of diet have been blamed for the increasing incidence of diabetes. Improper hygiene not only in regard to eating but also in other directions, especially lack of exercise and sedentary habits, has resulted in an increasing occurrence and degree of obesity which, according to the statistical evidence, is associated with a rising mortality rate in cardiac, arterial and renal diseases, in cancer and in diabetes. Overweight conditions should therefore be prevented if possible. Every degenerative disease gives evidence that obesity has a very adverse influence on the life of human beings. The underweight individual apparently has a better chance to live long than the so-called normal or ideal weight person. This really should be thought of as average weight of apparently healthy indi-

viduals, which implies something different than the term normal or ideal weight. The weight standards for the best health in vogue at present are apparently too high. Obesity evidently accelerates degenerative changes, that is, deterioration of the tissues and arteriosclerosis, which as previously suggested, is one of the main processes concerned in the impairment of carbohydrate tolerance resulting in diabetes.

Nutrition is the difference between the amount of food consumed and the quantity utilized by physical effort. The storage of fat, resulting in obesity, because of a lack of balance of these factors is not synonymous with overeating of fats, starches and sugars though this is often taken for granted. Obesity is a signal that the tissues have been damaged and that the body is being strained. The first comes about through fatty infiltration of the tissues, the second is the result of the presence of an excess of body bulk which must be kept warm and which must be carried about. The two handicaps call for separate evaluation and different treatment in each individual. There is a distinct hazard for the obese subject if these two elements in the situation are not given individual consideration. Consequently, propaganda that are made concerning the dangers of obesity should be confined to the necessity and the means for the prevention of obesity, and the control of moderate gains in weight. The reduction of weight for the markedly obese individual, on the other hand, should always be carried out under medical supervision and should not be undertaken with the sole guidance of printed leaflets and radio talks.

The overeating of sugars, starches and fats will result in obesity. The high consumption of sugars and starches is often stated to be a cause of diabetes, independently of the effect they exert through the production of obesity. The charts demonstrating the parallelism between sugar consumption and the incidence of diabetes in different countries have been widely circularized. Recent studies in normal persons and in diabetic individuals show that the

habitual eating of considerable quantities of sugars and starches improves rather than impairs the carbohydrate tolerance, provided glycosuria is not present. The conclusion therefore is warranted that the excessive use of starches and sugars favors the occurrence of diabetes indirectly through obesity, but that the consumption of starches and sugars, even in large amounts, is not a cause of diabetes. In fact, the available evidence indicates that it improves the sugar tolerance. Glycosurias, occurring after high starch diets, point to a previously existing deficiency of carbohydrate tolerance, that is, a tendency to diabetes. According to these facts there is no reason for limiting the consumption of sugars and starches except insofar as these classes of foods will result in obesity.

The proportion of proteins, especially meats, in the average diet is constantly diminishing. This implies that carbohydrates and fats replace the proteins and tend to cause obesity. Aside from this aspect which has already been discussed, there is the danger that a deficient protein ration will result in tissue degeneration. Secondary anemia, edema and nephritis have been produced by such diets. It is very probable that an insufficient supply of animal proteins continued for a long time entails degeneration of various organs and arteriosclerosis that will impair carbohydrate tolerance and accentuate any diabetic tendencies. An educational campaign for the proper use of animal proteins in the routine diet is urgently necessary.

Internal secretions. The most significant factor in the control of diabetes lies in the functions of the glands of internal secretion. Except for the use of insulin which has been discussed, there are no practical aids available for general application at present. Consequently, this important phase of the etiology of diabetes is omitted.

Summary and Conclusions

Organization of resources in medicine. Problems and questions without end have been touched on in this lecture.

For the promotion of their solution it is proposed that associations of metabolism clinics be organized in various cities. In New York such an association might well be under the auspices of the Academy of Medicine. The activities of such a section within the Academy should not be confined to diabetes as there are too many other diseases to warrant the creation of a group solely for the study of diabetes, and by implication to segregate a certain number of physicians and specialists in diabetes. Many of us have believed for some time that applied physiology or functional pathology, or pathological physiology, is as important as anatomical pathology for the understanding of disease. The medical profession should recognize this by creating a younger brother of the pathological society. The phrase, "diseases of metabolism", is in common use but poorly defined; possibly it may be described as that group of disturbances depending upon functional pathology, such as diabetes, hypertension, etc. An association of metabolism clinics should bring about a very desirable unification and increased effectiveness of the present sporadic efforts in postgraduate teaching, gathering statistics, carrying out research, improving treatment and initiating preventive measures not only for diabetes mellitus but also for other diseases of equal, if not greater importance, from the point of view of public health.

Rising diabetes mortality rate. Mortality statistics reflect the incidence of diabetes rather than diabetes as a cause of death. The aging of the population favors the development of diabetes. The more frequent and more thorough physical examinations during recent years, especially of women, have revealed many cases of diabetes that would otherwise not have been discovered. The use of insulin has prolonged the life expectancy of diabetic subjects so that they should, under ideal conditions of treatment, not succumb to diabetes but to the same causes of death as persons not afflicted with diabetes. All these reasons do not suffice to account in full for the rapid advance in the total incidence of diabetes, nor particularly in women over 45 years of age.

Prevention of diabetes. It is not feasible to accomplish a great deal in this direction until more complete and reliable information is obtained concerning the onset of diabetes at different ages and in the two sexes, and concerning the etiology of diabetes. The Board of Health can throw light on the problem of diabetes incidence by collecting the results of physical examinations from various sources and possibly by requesting reports of the discovery of diabetes by practitioners. The part played by heredity, menopause, pregnancy, gall stones, glandular activities, nervous disorders and other possible causes of diabetes, calls for further investigation before popular statements can be finally and authoritatively made as to the influence these factors exert upon the carbohydrate tolerance in human beings. An educational campaign concerning the eating of meats, fats and carbohydrates, and the dangers of obesity is desirable and warranted by the available facts.

Diabetics should not die of diabetes. The methods and objectives of diabetes treatment available today are adequate to accomplish this. They are not as universally applied as they should be. In order to bring this about the treatment should be simplified and be kept free from all unnecessary formalities; more responsibility should be assumed by the physician and less by the patient than is often advocated; opportunities for acquiring the facts concerning the routine management of diabetes should always be available for the practitioner of medicine in the larger cities; every hospital should have its resources so organized that the medical, the surgical and the nursing staffs, the laboratories and the diet kitchens are capable of meeting all diabetic problems and emergencies; every serious illness in a diabetic patient calls for hospitalization and not for home treatment; the physician should not hesitate about insisting on the constant maintenance of the ideal standards of treatment in all his cases, for a deviation from them, within a few months or years, will result in irreparable damage.

Discussion: Public Health Problems

Charles Bolduan

It is indeed a pleasure to be privileged to discuss Dr. Mosenthal's very instructive paper on diabetes. His analysis of the nature of the disease is most helpful, for it brings out the various possible causative factors which must receive attention in any program for control of diabetes. From what Dr. Mosenthal has said it will be clear that the problem is by no means simple.

An examination of the various text books on the Practice of Medicine published during the first half of the 19th century shows clearly why diabetes was not readily recognized. The disease is generally classed among the disorders of the urinary system. Among the symptoms, the excretion of large amounts of urine is always given a prominent place. Reference is made to cases in which there is no sugar in the urine, and to the presence of albumin in some of these cases. It is suggested that this condition represents an early stage of diabetes. So far as the presence of sugar in the urine is concerned, the earlier text books (e.g., Cullen in 1822 and Dunglison in 1842) speak only of the sweet taste of the urine, and of the crystals of sugar which form when the urine is evaporated. Some text books of this period also refer to the fact that the urine ferments on the addition of yeast. It is noteworthy that all the older texts state that diabetes is about twice as common in males as it is in females.

Texts published about the middle of the 19th century often mention Moore's test, or the brown color produced on boiling the urine with caustic potash. In George B. Wood's Practice of Medicine, Second Edition, published in 1849 a foot note refers to Moore's and to Trommer's tests, though the body of the text mentions merely the sweet taste and the formation of sugar crystals on evaporation. Tanner's text book (1858) mentions Trommer's and several other chemical tests for sugar. John King in his book "Chronic Diseases", published in 1867 mentions Parry's

modification of Fehling's test. Niemeyer's Practice of Medicine (Translation, New York, 1869) describes Trommer's, Moore's and Fehling's tests. The last named is employed for the quantitative determination of sugar, though judging by the text books such determinations were more often made by fermenting the urine with yeast. For this purpose the sample was divided into two parts, yeast being added to one. Both specimens were then kept for 24 hours in a warm place and then the specific gravity of each was determined. Every degree of difference in the gravity, corresponded to 10 grains of sugar per ounce of urine. (Robert's test). Some writers speak of the use of the polariscope in determining the amount of sugar.

It is clear that by 1860 the methods of testing urines for sugar were sufficiently well understood to make the detection of glycosuria a simple matter. To what extent was this information applied? Naturally we should expect such tests to be utilized first in the better hospitals. The general practitioner would probably lag behind the leaders in the profession. In this city New York Hospital was not only one of the oldest but the leading hospital. Its physicians stood high in the profession. What do the records of this hospital show?

I went over 409 consecutive case histories of medical patients admitted between March 26 and October 15, *1860*. In only 63 case histories is there even any *mention* of the character of the urine, and in only 19 of these 63 does this state the results of a chemical test, namely the test for albumin. In the remaining 44 cases where the urine is mentioned, the comments are limited to such phrases as "Scanty and high colored", or "High colored and acid", or "Abundant and clear". In not one of these 409 cases is there a single instance of a test for sugar, and naturally, not a single case of diabetes. It may be remarked that of the 19 cases tested for albumin, there were three in which microscopical findings are reported.

Out of 250 consecutive case histories of medical patients treated in *1869* only 17 had any mention of the character

of the urine, 12 of these 17 mentioning tests for albumin. In six cases a microscopical examination is recorded. There are 5 cases of Bright's disease in which the only urine information is a record of the daily quantity. Again, not a single test recorded for sugar, and of course, not one case of diabetes among these 250 consecutive medical cases.

In *1880* some progress is already evident. Compared with the histories of a decade before, we find an increased proportion of tests made of the urine. Moreover the examination always includes microscopical work. The chemical tests, to be sure, are limited to tests for albumin. Only in one instance, a case of diabetes, is the presence of sugar mentioned. Out of 100 consecutive medical histories, 37 reported tests of the urine. In all the medical cases admitted from October 1879 to July 1880, some 300 in number, there was only one case of diabetes.

The medical histories of *1890* reveal that routine tests of the urine for albumin, sugar and microscopic appearance have been inaugurated. A study of the histories shows that a report of the findings is always recorded, except in a few cases in which circumstances apparently made it impossible to obtain a specimen of urine. It may be noted that out of 236 consecutive cases not a single case of diabetes was treated.

A glance at the *surgical* histories of this period indicates that routine urine examinations, if made, were only very infrequently recorded. In two cases of gangrene the urine is stated to be normal. Perhaps this indicates that it was tested for sugar. As a rule there is no mention of urinary findings.

During the thirty years, from 1860 to 1890, we see then a progressively increasing interest in the character of the urine in the medical patients treated at the New York Hospital. But if the practice of examinations of the urine for sugar was so slow in becoming a routine measure in one of the city's foremost hospitals, we may be sure it was very much slower among private physicians. In fact it is not a routine procedure even now.

Dr. Mosenthal has referred to the marked increase in the registered death rate of diabetes, and has, I am convinced, correctly ascribed the sharp increase occurring in 1901 to the adoption of the International Classification of Causes of Death. Dr. Guilfoy, who became Registrar of Records in that year, shares in this view.

Inasmuch as there has been a steady increase in the diabetes death rate since that time I wish to point out a number of factors which have undoubtedly played a considerable part in this increase.

First—the increasing practice of physicians to have the urine of their patients examined for sugar. This readily explains the steady rise in the registered death rate from 1870 to 1900. Added to this is the more frequent routine medical examination of women, including tests for urine, during the past thirty years. The fact that even now, as Dr. Mosenthal has told you, out of 1600 cases of diabetes treated in 24 hospitals in this city, nearly one-third were diagnosed after admission for some other ailment, indicates that this factor must still be reckoned with.

Second—is the aging of the population. I have calculated that if New York City had the same age distribution in 1930 that it had in 1900, the diabetes death rate in 1930 would have been four points lower than it was, i.e., 22 instead of 26.

Third—the enormous influx of Jewish immigrants into this city from 1900 to 1915. From a detailed study of deaths among Jews and non-Jews, I feel confident that our diabetes death rate would have been nearly two points lower in 1930 if we had only the same proportion of Jews that we had in 1900. The large Jewish population accounts largely for the fact that the diabetes death rate in New York City is higher than it is in other large cities. That Boston with a much smaller proportion of Jews also has a high diabetes death rate is explained by the large proportion of non-residents among its diabetes deaths. In Boston

this amounts to about 20 per cent, while in New York it is only 2 per cent.

Inasmuch as immigration practically ceased in 1915 we may look for a cessation of the rise in diabetes mortality, at least as far as the Jewish factor is concerned, after the next decade or so. After that the death rate should become fairly stabilized except as it may be influenced by the other factors.

A Fourth factor which has been advanced by some students of the problem to account for the rising diabetes mortality rate is the prolongation of life brought about in diabetics by the administration of insulin. It is true that insulin treatment causes the diabetic to die at higher age periods than was formerly the case and it has, therefore, affected the course of the specific death rates in the higher age groups. But the death of these persons would presumably have been charged to diabetes in any case, and would not therefore have influenced the general diabetes death rate, i.e., the rate for all ages calculated on the total population.

Altogther I am convinced that these various factors must be borne in mind before we devote much effort to a search for other causes of the increasing mortality charged to diabetes—and before we draw conclusions from such facts as the parallelism between sugar consumption and diabetes mortality.

I am beginning to feel that the various factors just mentioned are perhaps sufficient to explain nearly if not all of the registered increase in diabetes mortality. In 1901-5 the rate in New York City was 13.8 per 100,000; in 1926-30 it was 24.4. I have already accounted for over half of this increase by the change in the age composition of the population and by the increase in the proportion of Jews. The marked rise in the diabetes death rate among females, which, after all, is the one great factor responsible for the mounting diabetes death rate, is very probably

largely fictitious in the sense that it most likely reflects principally the increased frequency with which women are having urine examinations made for sugar. I am very skeptical of the view that during the past thirty years there has been any such increase in the prevalence of diabetes among women as would seem to be indicated by the mortality statistics.

The significance of the varying course of the diabetic mortality for males and females in the different age groups is still obscure. The matter will probably become clearer once we have more complete information regarding the prevalence of diabetes in the population. In the case of communicable diseases the Department of Health obtains such information by requiring the notification of all cases of the disease. The suggestion that the same procedure be followed in the case of diabetes has not been received with favor, and it has also been questioned whether it would be necessary for the Department to require such reports. Perhaps sufficient information regarding the incidence of diabetes can be obtained by random sampling.

From the graphs which Dr. Mosenthal presented you will have seen the great preponderance of females over males in the diabetes deaths of persons over 45. I am able to add an interesting fact to this showing. Classifying the diabetes deaths in New York City during the years 1931 and 1932, according to age, sex and civil conditions, I find that among *unmarried* persons over 45 years of age, there is no such preponderance of females over males. In fact the rates are about the same for the two sexes. Inasmuch as the preponderance of females among the diabetes deaths over 45, is marked both among *married persons, and among the widowed,* strong support is furnished for the belief in some influence of pregnancy as a factor in diabetes. I hope that this point will be discussed by some of the other speakers.

Dr. Mosenthal has pointed out the unsatisfactory character of our present mortality statistics on diabetes, and

indicated clearly that they give a misleading picture of the fatality due to that disease. Others have made similar criticisms of the tables of diabetes mortality published by the Department of Health. In this connection I have recently been sending letters to physicians signing death certificates giving diabetes as the cause of death. Out of 463 such deaths inquired into, death was stated to have been caused by *coma,* in 172 cases. Dr. Mosenthal cited Joslin's experience in the marked reduction of coma deaths following the introduction of insulin. You may recall that in the period 1928-30 only about 10 per cent of Joslin's patients died in coma.

New York City's figures, based on the 463 letters to which I have referred, show 37 per cent of the recent deaths to have been the result of coma. I am now trying to learn what proportion of these coma cases were true diabetic coma. Since diabetic coma is preventable, any considerable proportion of such cases emphasizes not only the need of organizing control measures, but gives assurance that such measures will achieve worth-while results.

In the present state of our knowledge, what might be some of the first steps of such a program? How could the Department of Health contribute to the plan?

From what Dr. Mosenthal has said it is clear that our knowledge concerning diabetes is still very incomplete. Hence much of our effort should consist in devising and carrying out a much more thorough study of diabetes. We already have a number of excellent clinics devoted especially to diabetes. These might well constitute the nucleus around which to organize well-coordinated investigations into various important phases of diabetes. Perhaps an association of these clinics, modeled on the Association of Tuberculosis Clinics, would stimulate work of this kind. In addition to this the Department of Health should continue to collect statistical information on diabetes, seeking especially to discover the incidence of the disease, and to obtain more accurate data regarding fatal cases.

So far as incidence studies are concerned, the Department of Health might undertake urine examinations in connection with its medical examination of those applying for employment certificates, and of those attending continuation schools. Perhaps also such examinations could be made of mothers attending the Baby Health Stations. A limited number of persons could also have their urine tested for sugar in connection with the Health Department's one clinic for the examination of food handlers.

The suggestion has been made that the medical examination of school children include a test of the urine for sugar. It is not likely that this would be feasible for the examinations made by the Health Department's physicians, but the suggestion might be adopted for the examinations made of school entrants by private physicians. It must of course be considered that the proportion of cases of glycosuria discovered in this way would probably be very small. Possibly the high school authorities could be induced to make routine urine examinations of all their pupils, having the work done in their own chemical laboratories.

Another measure which might become a part of the control program, is the examination of other members of a diabetic's family. By means of visits made by nurses to the homes of diabetics attending free clinics, such examinations could be encouraged. It is possible that this would result in the discovery of unsuspected cases of diabetes, perhaps in an early stage of the disease.

Despite the obscurity which still surrounds our knowledge of diabetes, the fact remains that medical science already has at its disposal a considerable fund of information the application of which is effective in dealing with diabetes. Unfortunately this information is not sufficiently disseminated either among the medical profession or the general public. An important part of a control program should therefore consist in making this information more generally available.

So far as the general practitioner is concerned it would be helpful to organize courses of instruction at the various diabetic clinics. These courses should be so arranged that almost all the time a course would be going on at some one clinic.

The Health Department should disseminate information to the general public regarding diabetes, especially information which calls attention to the prevalence of the disease, the importance of medical examinations for its discovery, and the excellent results following proper treatment. The Department might also prepare exhibit material, for the education of diabetics in matters of diet. Such material would include reproductions of some of the more common articles composing a diabetic diet; lists of foods showing the carbohydrate, fat and protein content; booklets of recipes; circulars on skin and foot hygiene, etc.

The program should also seek to provide *diagnostic* facilities for diabetics unable to pay a specialist's fee. After all, every effort should be made to keep as many of the patients as possible under the care of the family physician. Possibly laboratory facilities for the determination of blood sugar for private physicians, should be provided by the municipal authorities. A free diagnostic consultation service, similar to that now provided free to physicians for their suspected cases of tuberculosis, might be established.

Special consideration should be given to meeting the insulin needs of really indigent patients. During the past two years this problem has been most pressing.

These might well be the first steps in organizing a program for the control of diabetes. Additional steps must be evolved as we proceed. The health problem presented by diabetes is important and it is urged that we make a start. I hope that Dr. Mosenthal's address will mark this happy event.

Discussion: Heredity and Prevention

Elliott P. Joslin

With two thousand deaths yearly from diabetes mellitus there is no question but that New York City has a problem in its diabetic situation and it is also true that all the rest of the country is watching to see what the City which gave us Dr. Hermann Biggs will do with it. Every word spoken by Dr. Mosenthal and Dr. Bolduan emphasizes its importance. To Dr. Mosenthal's clear statement of the situation I wish to add two premises—first, the duration of life of the diabetic has doubled. Now one is dealing with a ten-year disease and not, as half a generation ago, with a five-year disease. Furthermore, the duration of life of the diabetic is continuing to advance. Therefore, all plans for treatment must be conceived on a ten-year basis as a minimum. Second, the average age at death of a diabetic is now 61 years. Half a generation ago it was 44 years. Each year of life you add to the life span of a diabetic by so much you increase the care of a diabetic old age. If the patients are hospitalized, they almost become immortals. because in a hospital the treatment of diabetes is so good. A single, old, diabetic occupying a bed in a hospital for a year bars admission to 52 young and hopeful diabetics each for a week's stay.

Three principles underly the Control and Prevention of Diabetes—the topics assigned to me in this symposium. (1) Diabetes is a Doctor's Disease. It is a disease for the doctor to treat and not for the state, the city or for boards of health. It is not a contagious disease. Diabetes should be treated in the home by the family doctor. The disease is chronic, but its complications are acute and diabetics need their doctors for temporary care as often as for permanent care. Treatment is individual and not wholesale, and, furthermore, the treatment is so individual that the patient who pays for it is the one who appreciates it and is helped most by it. In every way the family doctor should be encouraged to treat diabetes and it should be made easy for him to do so, (a) by providing cheap blood sugar and

other similar tests. In a laboratory these can be done at a profit at a very small outlay provided 20 or 30 blood sugar tests are done daily, but if the tests are done singly the expense is great. Hence, arrangements must be made by the doctors among themselves or in connection with hospitals by which such tests can be performed collectively. The secret lies in the doctors combining and thus producing an output sufficient to reduce costs. (b) A Wandering Diabetic Nurse would be of great assistance to a doctor in the education of his patients and of this I will speak later. (c) If free insulin is to be distributed it would seem wiser to give it away through the individual physician rather than wholesale in large clinics. A little insulin will go a long way in this manner. By keeping the treatment of diabetes in the hands of the private practitioner I believe money will be saved for the Government which otherwise would be swamped with thousands of diabetics demanding a dole.

(2) Focus on the Family for the Prevention of Diabetes is the second principle I would urge, because heredity is the most important factor in etiology. Naunyn found heredity in 18 per cent and Dr. Mosenthal has referred to the commonly accepted view of 20 per cent and originally that per cent existed in my group of cases, but this percentage has changed. Dr. Priscilla White in studying our children has found that the heredity is now 34 per cent for the whole group, but that for the children who have had diabetes ten years or more it is 49 per cent. So, too, with adults, a group of cases seen five years ago showed an heredity of 28 per cent, but during the five-year period continued questioning has disclosed new evidences of heredity and the 28 per cent has changed to an heredity of 37 per cent. The parents of diabetic children show diabetes four times as often as do the parents of non-diabetic children and diabetes was found to be ten times as common in the brothers and sisters of diabetics as in the siblings of the control population. So interested have we become in this question of heredity that the records of some 500 cases were submitted to the Department of Physiology at

Harvard University. The data were collected with great care by Dr. White and have been analyzed by Dr. Pincus and their paper has been accepted for publication by the American Journal of Medical Sciences. They find that diabetes is inherited in the Mendelian recessive fashion. Finally, 105 relatives of our patients have been studied by Dr. White and in this way ten undiagnosed cases of diabetes were found.

Whenever a patient comes to the office we make it a point casually to ask, "Has anyone in your family developed diabetes?", because we want the patients to realize this hereditary element and to protect their families. Who cares more for your father and mother, your brother and sister and for your children than yourself? Focus on the family to prevent diabetes.

Thus far the evidence leads us to conclude that if two diabetics marry, their children will develop the disease; if a diabetic marries a non-diabetic but of a diabetic family one-half of the children will develop the disease; if two non-diabetics but hereditarily predisposed to diabetes marry one-fourth of the children should show diabetes; but, if a diabetic marries a non-diabetic of a non-diabetic family, the children will escape the disease.

Obesity. In contrast to an hereditary, "blameless" diabetes is the "blamable" diabetes associated with obesity according to Priesel and Wagner. When the onset of diabetes occurs after the age of thirty-five there is usually a history of obesity. In one series of 1,000 diabetics there was hardly a diabetic between 50 and 60 years of age who was not over-weight prior to the onset of diabetes, and a second series of 1,000 cases confirmed the early observations. Therefore, do not get fat if anyone in your family has diabetes. Again to promulgate this doctrine one should *focus on the family.*

Dr. Bolduan's interesting statement about the frequency of diabetes in married in contrast to single women excited my curiosity. Some years ago Mr. Mead of the Lincoln

National Life Insurance Company pointed out that the frequency of constitutional diseases in general increases as age advances and particularly as obesity advances, but that diabetes is to this extent an exception to the rule; its incidence increases with age only in the fat, while in the thin it remains constant throughout life. I wondered what would be the average weight of our married diabetics over 45 years of age as compared with our single diabetics and to answer this question my office was turned upside down for several days.

Among our last 4,000 diabetics Dr. Root and my secretaries found 1,437 females with onset of the disease above the age of 45 years. Of this number 1,326 were married and their average weight was 181 pounds. One hundred and eleven were single and their average weight was 20 pounds less or 161. I submit these facts in explanation of Dr. Bolduan's discovery. There were 295 Jewish patients and their average weight was 176 pounds whereas the average weight of the Gentile patients was 180 pounds. Incidentally, the charts showed that the married Gentile patients without children had an average weight of 180 and the married Hebrew patients without children a weight of 185 pounds. The heredity of the Gentile females was 29 per cent and of the Hebrew females 31 per cent.

Puberty, pregnancy and the menopause are periods when obesity readily develops. Convalescence from operations, accidents and infectious diseases furnish another occasion for becoming fat. The transfer from active occupations plays a great role. Therefore, *focus on the family* to prevent diabetes and urge each patient to warn his relatives not to get fat.

(3) Focus on the Patient for the Prevention of Complications. Prior to 1914 the mortality for diabetic coma was 60 per cent in my group of patients and approximately the same percentage held for the cases of von Noorden. Fortunately, Dr. Augustus I. Knight, Medical Director of the Metropolitan Life Insurance Company, was my teacher in 1892 in the Harvard Medical School and through his

courtesy and under the supervision of Dr. Dublin and Mr. Marks of his Department summaries have been made of the causes of death of my patients. It appears that in the first few years following the discovery of insulin the coma mortality dropped to 20 per cent; in the middle Banting period it fell to 10 per cent, and a few days ago Mr. Marks informed me that during the last three years the percentage of coma in patients formerly under my care but who have died in various parts of the country was 4.8 per cent. These figures show improvement of treatment not of any one doctor but of a whole group of doctors. I am quite sure that there must be some error in the high percentage of deaths from coma in New York City and I think a closer analysis of the same would lower the coma rate. To determine the point hospital deaths might be segregated and analyzed separately.

Coma is just around the corner from every diabetic—young or old—and, therefore, one must *focus on the patient* to prevent this complication. The patients must know the six rules which they are to follow whenever indisposed. I forebear repeating them again in this place.

Another example of the importance of training the patient, but not mentioned this evening, follows. In January, 1932, the mortality from diabetes according to the Metropolitan Life Insurance Company for the approximately 21 millions which it insures was 22 per 100,000. In January, 1933, it was 32 per 100,000 or approximately an increase of 50 per cent in one year and I suspect that this increase was due largely to the influenza epidemic of 1933. This shocking increase I believe could have been reduced if patients had been taught the value of insulin during infections. For some time we have tried to make our patients realize that although they do not need insulin regularly, it is life-saving when pneumonia or some other infection develops. Often we give them insulin temporarily just to make them acquainted with it. In this way we *focus on the patient* and train him how to use insulin when infections arise.

Tuberculosis is not frequent in diabetics today, but Dr. Root and Dr. White have found in studies upon children that the diabetic child has ten times as much tuberculosis as the ordinary school child of similar age in Massachusetts. Obviously one must focus on the patient and prevent exposure to tuberculosis.

Finally, the care of the skin of the diabetic, particularly of the feet, is of the utmost importance. I tell my diabetics that I want them known as the cleanest citizens in the community. Gangrene exacts a fearful toll, but in a measure it can be avoided by care of the feet and cleanliness.

The education of the diabetic with his ten-year disease is everything. Last year one of our Wandering Diabetic Nurses visited 20 poor families during a five weeks' trip to three States. Before sending her we wrote the doctors, thus securing their approval of the visit. I know that she accomplished much. If one nurse can see 20 patients in three States in five weeks she can see 200 patients in 50 weeks, and in a city could certainly visit 400 diabetic homes in a year. Doctors need Wandering Diabetic Nurses at their disposal to help them with their poor patients as well as with their patients of moderate means. A Wandering Diabetic Nurse for one day in the home accomplishes far more in the prevention of diabetic complications and in the prevention of diabetes than often can be achieved by several office visits.

Diabetics now live ten years and will live longer.

Diabetics die at 61 years and will die older.

Diabetes is a disease to be treated by the doctor in the home.

Focus on the diabetic family for the prevention of diabetes.

Focus on the patient for the prevention of complications.

Discussion: Clinical Phases

Nellis B. Foster

The facts brought out in Doctor Mosenthal's paper and the discussion throw into prominence the two important factors in the etiology of diabetes. These are: the immediate factor which the consensus of opinion now assumes to be a disorder of the pancreas, and the ultimate factor, the causation of the deficiency of the pancreas. There is constantly increasing evidence that the ultimate factor in diabetes is inheritance. If diabetes be an heritable disease, then any attempt at the eradication of the disease must depend upon eugenics. It is conceivable, if diabetes is heritable, that the propensity to the disease is different in different individuals. If this propensity is very pronounced the disease develops in early life, if it is slight it develops in later life or depends upon circumstance. Now, circumstance is environment—a very complex matter including nourishment, occupation and many other factors. It seems, then, a little dubious whether it is possible to entertain much hope of controlling the incidence of diabetes if this incidence depends, in the first instance on inheritance, and in the second upon environment. In the last analysis both factors mean for the individual a self-imposed discipline in life which we could hardly expect, human nature being what it is. It seems to me that we ought to face the fact that diabetes is likely to increase, simply, because we now have at our hands a means of keeping diabetics in relative health and tainted stocks are sure to propagate.

While control of incidence seems dubious, we are however on sure ground in our ability to aid the individual who has diabetes. His outlook not only for life but also for comfort and happiness can hardly be compared with that outlook a decade ago. When we think of the treatment of diabetes we think first of diet. But with insulin, diet is gradually becoming less and less a matter of restriction in food, rather, it is a search for the proper quantities and character of foods required by different persons. Measured

in calories, two individuals of approximately the same age, height and weight may differ by as much as fifty per cent in the amount of food necessary to keep them in a state of good nutrition. There is then, in my opinion, no such thing as a standardized diet for diabetics. The problem must be worked out for each individual and the test of success is the state of nutrition and the energy that the person has. There has been a great departure from the older ideas, chiefly, with regard to carbohydrate intake. I presume that at present the average adult diabetic among my patients is taking somewhere between two hundred and two hundred and fifty grams of carbohydrate a day. It is on carbohydrate that we depend particularly to change caloric intake. Protein is more or less fixed and the majority of people do not care for fat excepting as butter and cream. There is a good deal being said about fat in relation to the development of arteriosclerosis. The only definite evidence we have at the present time is derived from animal experimentation and it is wholly unsafe to assume that like conditions prevail with human beings.

In arranging the life of a diabetic, sufficient attention is not given to exercise. It is commonly recognized that exercise increases the ability of the tissues to utilize sugar; this is exemplified in the fact that patients who are using insulin require less when they are taking exercise. But this principle is not largely applied in the general management of this disease. It would be better if it were.

The third important consideration in treatment is the psychic state of the patient. I should like to amend the definition of good treatment that has been given by Doctor Mosenthal, who mentioned the laboratory tests and the standards which must be met. That is not sufficient. Laboratory standards may be met and yet the patient may not be in a state of mental serenity and so reconciled to his handicap that he can carry on his life in the healthy way. It is sometimes difficult to educate a patient to live in harmony with his disease, but it is absolutely essential, I think, that this be done. With children it is usually not

difficult and the necessary formalities become habits which sink into the background of consciousness; the same thing, however, must be done with adults. The ideal is to teach patients to give themselves good care and at the same time not to become emotionally obsessed by the necessities.

Discussion: Recent Trends in Diabetes Mortality

Louis I. Dublin, Ph.D.

Dr. Mosenthal's paper and the discussions by Dr. Joslin, Dr. Bolduan and Dr. Foster have been so rich in content that it is hardly necessary for me to present a set paper on diabetes. Possibly the most useful contribution that I can make is to touch on the high spots in these several papers, to help leave in your mind a unified impression and more especially would I touch on those aspects of the problem that relate to the control of this condition as a public health measure.

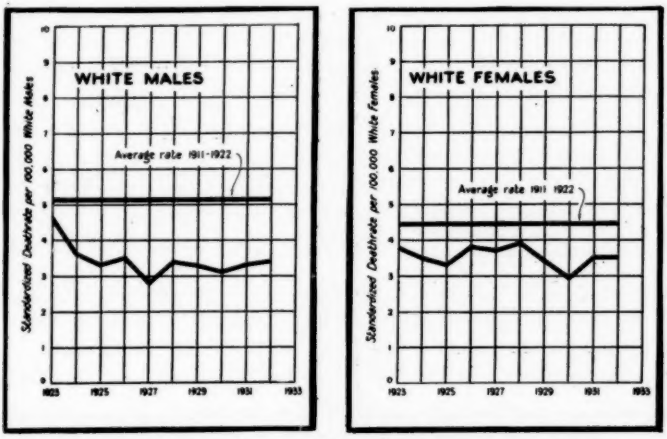
The first point that I would make is that diabetes today presents a serious and growing public health problem. This has developed in the course of the present generation. Thirty years ago diabetes was a minor cause of death. Even if we grant the incompleteness of registration, it is perfectly clear that a relatively small number of deaths from diabetes actually occurred. Today, it is tenth in the list of causes of death. Among females, it is ninth in order of importance and if we limit our comparison to ages 45 and over, it is seventh in order of importance as a cause of death. Today, more women over 45 years of age die of diabetes than of tuberculosis. In fact, we know that from two to three per cent of our present population will ultimately die of diabetes. It is for these reasons that more and more public and medical attention must be directed to the problem of diabetes, and an organized program of control developed, as was done for tuberculosis a generation ago.

I would not, however, exaggerate the seriousness of the present diabetic situation. It is easy to overstate the case.

Chart 1

TREND OF DIABETES DEATH RATE IN THE INSULIN PERIOD

Ages Under 45 Years



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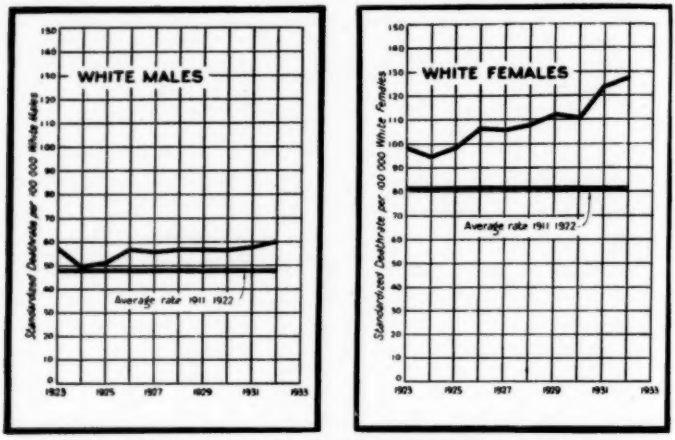
As Dr. Mosenthal has already indicated, and as is shown in Charts I and II for the Metropolitan policyholders, the increase in the mortality from diabetes is altogether limited to ages 45 and over. Under age 45, there has been marked improvement in the situation, and even after 45 the increase is pronounced primarily among women. So far as men are concerned, there has been little change in the situation between ages 45 and 65, and such increase as has occurred is limited to old men. We are today concerned, therefore, with diabetes chiefly as a problem of women in middle and later life, and secondly as a problem of old age in men.

The discovery of insulin did bring about a new era in the treatment of diabetes. It has undoubtedly proved a marvelous remedy. This is clearly indicated by the improvement in the mortality at the younger ages where

Chart 2

TREND OF DIABETES DEATH RATE IN THE INSULIN PERIOD

Ages 45 to 74 Years



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heretofore the disease was, in most instances, a death warrant. In so far as the older people are concerned, insulin has proved an effective agent in prolonging the life of the diabetic many years. But this very fact helps, in a measure, to explain the phenomenon of the increasing death rate. The extensive use of insulin has served to increase the number of cases after age 45, and in this way has helped to shift the mortality from the younger ages to the older ones.

Another point of some interest is the shift in recent years in the ratios of deaths between the two sexes. Thirty years ago, all of the tabulations showed a slight excess of males over females. Today, we find almost uniformly many more deaths among females than among males, and the death-rates after 45 are twice as high among women as among men. This is an interesting problem that calls for more intensive study.

In a very real sense, there is a paradox in the present diabetic situation. There has been an undoubted improvement in the treatment of the disease. Nevertheless, this improvement has been accompanied with an increase in the number of deaths. It is necessary to conclude, therefore, that there are today many more cases than occurred in the past. I wish it were possible to register the cases of diabetes as we have done for a long time the cases of tuberculosis, because then we should not have to guess at this increase and its extent. Possibly, in some localized area, or as a special demonstration, physicians will arrange to register their cases of diabetes with some central bureau in order that this problem of the incidence of the disease may be carefully and accurately studied.

This increase in the incidence of diabetes is, however, a two-fold one, partly apparent and partly real. Let us consider first what I have chosen to call the apparent increase. In the first place, we are today better equipped to recognize the disease and to diagnose it early. There has been a very great expansion in medical facilities. The technique of diagnosis has been greatly improved. Dr. Bolduan has shown how the more extensive use of laboratories in hospitals and clinics developed, and this has increased the number of cases on record. The increase in the amount of insurance carried by the population has contributed greatly in discovering many cases of diabetes. In many instances, persons have discovered that they had a diabetic condition only after they had applied for insurance and had been rejected by the company. The insurance companies have also encouraged periodic health examinations, and this has helped. But all of this improvement in medical facilities has not really added a single case to the number of diabetics. It has merely enabled us to identify more cases than was possible before, and when death occurred many of these cases were registered as deaths from diabetes, rather than from some other cause, as actually did happen in the past. The discovery of insulin itself created an intense and widespread interest in the disease. More

physicians now look for the disease than ever before. Altogether, there has been a great improvement in the registering of cases.

In like manner, the shifts that have taken place in the age and sex composition of our population and in the racial structure of our population, have helped to bring about an increase in the number of cases. There has been a shifting in the structure of the population in the direction of more women, more old people and more of the racial groups which have a high incidence of diabetes. Broadly considered, these changes in population structure may also be included as among the factors in the apparent rise of diabetes.

In contrast with these items, there are a number of causes which have been at work during the last generation which have, in a very real sense, increased the number of diabetics. The first of these social forces was the improvement in the standard of life of the population. During the last generation, there was a very appreciable improvement in the economic condition of the people. Real wages increased, and with this came an increase in the buying power of the people. On all sides the average man and woman could enjoy and did enjoy the use of more and more food and other comforts of life. At the same time, while this rise in the standard of life took place, and possibly as a concomitant of it was an increase in the use of machinery and a greater mechanization of industrial processes. More and more people took to industrial employment, and in such employment were called upon to a lesser and lesser degree to use their energy in the production of work. Nor was this shift from manual to mechanical labor limited to industry. It permeated the farms and the homes so that the entire population was relieved of much of the hard and heavy work which in previous generations was a part and parcel of the daily life of the people. So we are confronted with two forces, both operating to disturb the metabolic equilibrium of large numbers of persons. On the one hand, more food materials were taken in and, on the other, less energy was called for to burn it up. The net

result was over-feeding, and in the long run the increase in the number of people overweight and even obese. Unfortunately, it is among such overweight and obese individuals that diabetes takes its greatest toll. In this sense the very conditions of life in the present generation have made the increase of diabetes almost inevitable.

On the whole, however, the present situation in diabetes should not cause us to despair. So far as its increasing mortality is concerned, the problem is a very circumscribed one. It is one of controlling the disease in older people, chiefly in women. To some extent the increase at these older ages need not surprise us. Insulin does not cure diabetes. It does prolong the lives of diabetics, but it does not make them immortal. The disease comes chiefly in later life, and diabetics are prone to the development of heart disease, nephritis and arteriosclerosis, just as other old persons. These diseases occur relatively early among non-diabetic persons who are overweight, and it is not surprising that diabetics, most of whom are overweight, should suffer in the same way.

On the other hand, there are many things we can do to improve this diabetes situation. There are too many premature deaths from coma. We can postpone death from cardiovascular degeneration to a much greater extent than we have succeeded in doing. There are even today large numbers of cases which are not diagnosed as early as they should be. All this calls for an aggressive plan for attack and the speakers this evening have made some excellent recommendations which are a proper part of such a program. I know, too, that the Committee of the Academy of which Dr. Mosenthal is the head, is preparing to go forward with a program of this type.

Finally, I would stress the similarity between this program as it has been outlined by Dr. Mosenthal, and the classic program of control against tuberculosis which we associate with the name of Hermann Biggs. You will all remember that his conception of the campaign against

tuberculosis was broad and comprehensive. It involved all the agencies of the community. It emphasized their cooperation with the family of the tuberculous patient. He it was who first called for registration of these cases, and impressed upon his workers the importance of looking for the new cases in the families of those who were already sick with the disease. He established clinics for the better diagnosis of the disease and for the provision of necessary treatment for indigent patients who for one reason or another could not be treated in sanatoria. He organized the personnel at his command in such manner that there was a constant contact with families of the sick, and in this way they were given better care and guidance, and their families were helped to avoid acquiring the disease despite the presence of the sick individual. This program, associated with the name of Dr. Hermann Biggs, has produced the results which form one of the brightest pages in the history of public health, and they are an everlasting tribute to the name of the man whom we honor tonight.

But what Biggs did not realize was that in his campaign against tuberculosis he was showing us the way to methods for the control of other diseases of adult life, such as heart disease, cancer and diabetes. He builded better than he knew. It is, therefore, particularly gratifying to us tonight in hearing this fine lecture in his memory, which Dr. Mosenthal has given us, to find that Biggs' name and Biggs' prestige has its part in this new development in the public health field. We have a right to expect that his methods of attack extended to diabetes will have as much value and effectiveness as they had when applied to tuberculosis. I sincerely believe that when we gather again in ten years or in twenty years to evaluate the accomplishment of this program, we shall find that the recommendations of Doctors Mosenthal, Joslin and Bolduan shall have been just as successful in controlling diabetes as Dr. Biggs' program against tuberculosis, from which these men have drawn help and inspiration.

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DEATHS OF FELLOWS OF THE ACADEMY

Foster, Nellis Barnes, M.D., 850 Park Avenue, New York City; graduated in medicine from Johns Hopkins Medical School, Baltimore, in 1902; elected a Fellow of the Academy January 5, 1911; died, August 20, 1933. Dr. Foster was a Fellow of the American Medical Association, a member of the Society of American Physicians, a member of the Society of American Clinical Investigators, a member of the County and State Medical Societies, a member of the Alumni Association of New York Hospital, Attending Physician to New York Hospital, Consulting Physician to Woman's, Englewood, Mt. Vernon, and Goshen Hospitals, and Consulting Internist to Horton Memorial. He taught biological chemistry at Columbia University, 1906-12 and was an Associate Professor of Medicine at Cornell Medical College, 1914-17. In 1917 he was Professor of Medicine at the University of Michigan and Director of the Medical Clinic of the University Hospital. From 1919 to 1932 he was Associate Professor and from 1932, Professor of Clinical Medicine at Cornell Medical College. His services to the Academy were numerous and important. He was for five years a member of the Committee on Admission and its Chairman in 1925. He was a member of the Committee on Medical Education for eight years and its Chairman from 1928 to 1932.

Greene, Robert Holmes, M.D., 150 East 49 Street, New York City; graduated in medicine from Harvard Medical School, Boston, in 1886; elected a Fellow of the Academy October 1, 1891; died, August 28, 1933. Dr. Greene was a Fellow of the American Medical Association, a Fellow of the American College of Surgeons, a member of the American Society of Genito-Urinary Surgery, a member of the County and State Medical Societies, a member of the Urological Society, and Consulting Genito-Urinary Surgeon to City Hospital.

Nisbet, James Douglas, M.D., Van Wyck, South Carolina; graduated in medicine from the Louisville Medical College, Kentucky, in 1886; elected a Fellow of the Academy November 4, 1897; died, July 27, 1933.

Ward, Freeman Ford, M.D., 121 East 60 Street, New York City; graduated in medicine from the College of Physicians and Surgeons, New York City, in 1894; elected a Fellow of the Academy May 2, 1901; died, August 22, 1933. Dr. Ward was a Fellow of the American Medical Association, a member of the County and State Medical Societies, a member of the Gastro-Enterological Society, and a member of the Society of Alumni of Sloane Hospital for Women.

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